PTERIDOPHYTE HYBRIDS IN THE FLORA OF HISPANIOLA

John T. Mickel

Mickel, J. T. (New York Botanical Garden, Bronx, NY 10458). Pteridophyte hybrids in the flora of Hispaniola. Moscosoa 3: 83-90. 1984. — Seventeen known pteridophyte hybrids from the island of Hispaniola are discussed, and one of them Anemia X zanoni (A. hirsuta (L.) Sw. X A. underwoodiana Maxon), is described as a new species.

Los híbridos de los pteridófitos conocidos en la flora de la isla Española, por John T. Mickel. Existen 17 híbridos en los géneros de Anemia, Cyathea sensu lato (incluyendo Cnemidaria, Alsophila, y Nephelea), Diplazium, Lycopodium, Polydium, Polystichum, Pteris, y Thelypteris. El híbrido natural Anemia X zanonii (de A. hirsuta (L.) Sw. X A. underwoodiana Maxon) se reporta nuevo para la ciencia.

Since Manton's pioneering work on pteridophyte cytology (1950), there have been extensive studies on the chromosome numbers of the ferns and fern allies. One of the conclusions of this research has been that there has been extensive hybridization in these plants, as evidenced both by non-pairing chromosomes of recent hybridizations and by polyploidy that strongly suggests crosses sometimes in the past (Wagner & Wagner, 1980; Walker, 1973). Known pteridophyte hybrids were summarized by Knobloch (1976). The frequency of hybridization is not uniform in all pteridophyte groups. It might be expected in all genera, but is especially frequent in relatively few, such as *Anemia, Asplenium, Dryopteris,* and *Polystichum*.

During field work and herbarium study in preparation of the pteridophytes for the **Flora Vascular de la Isla Española**, the author came across several hybrids. The purpose of this paper is to point out the known hybrids in the Hispaniolan pteridophyte flora. Although seventeen hybrids are mentioned here, there are probably at least 30 to 40 different pteridophyte hybrids on the island.

Anemia

ANEMIA X PARAPHYLLITIDIS Mickel (A. hirsuta (L.) Sw. X A. phyllitidis (L.) (Sw.) This hybrid has not previously been reported from Hispaniola, but it is known from Mexico (Mickel 1982) and perhaps Costa Rica (Gómez 1980). It is generally produced from tetraploid parents, but in Mexico also by a backcross of the fertile hybrid of A. semihirsuta Mickel (A. hirsuta X diploid A. phyllitidis) with tetraploid or diploid A. phyllitidis (see Mickel, 1982, for details).

The author found this hybrid in three localities along the Dominican-Haitian frontier south of Restauración (on the Haitian side of the road, 28, 22.5, and 19 km S of Rio Libon, which are 41.8, 50.6, and 58 km S of Loma de Cabrera respectively; *Mickel 8712, 8715*, and *8719*), all on road-sides with scrubby vegetation.

Other collection include: HAITI, Mombin Crochu, 560 m, Holdridge 1346 (NY), and most likely also Ekman 6069 from HAITI, Dept. Nord, Hinche, between Cerca Carvajal and Bois-Charles, 600 m, which was reported by Christensen (1936) as a possible hybrid of A. hirsuta X phyllitidis.

Anemia X zanonii Mickel, hybr. nov. (Anemia hirsuta (L.) Sw. X A. underwoodiana Maxon (Figs. 1A-C.)

Planta hybrida inter A. hirsutam et A. underwoodianam a parentibus frondium divisione intermedia et sporis abortivis differt.

Rhizome compact, short-creeping, 3-5 mm diam, hairs orange, fronds erect, 15 -35 cm tall; stipe 1/3-2/3 of the frond length, stramineous, hirsute; blade narrowly deltoid, 4 - 6(8) cm broad at base. 8 - 15(18) cm long, once pinnate, papyraceous; pinnae 6 - 11 pairs, the central pinnae mostly 5 - 9 mm broad and 20 - 35 mm long, the basal ones to 11(15) mm broad, and 4(5) cm long, sessile, opposite to subopposite, occasionally with one pair of lobes, the upper pinnae narrowly adnate, lanceolate, cuneate at base, apex acute to acuminate; veins very casually anastomosing, 0 - 3 anastomoses per pinna, the margin minutely serrulate, hirsute; fertile pinnae approximate to the sterile blade, equal to or surpassing the sterile blade in height; spores abortive, echinate; chromosome number n = 152 I (fide Walker, 1966).

Distribution: Hispaniola and Jamaica, but to be looked for in Cuba where both parents occur; disturbed banks in light shade or full sun; 250 - 900 m.

Type: DOMINICAN REPUBLIC. Prov. Santiago Rodriguez, La Meseta, 11.7 km from El Cepillo part of Monción on road to La Leonor and Aguacate, 1550 ft elev, 8 Mar 1982, *Mickel 8630* (holotype NY; isotypes to be distributed).

Other specimens examined: DOMINICAN REPUBLIC. Prov. Dajabón, 6 km S of Loma de Cabrera on road to Restauración, 1050 ft, *Mickel 8637* (NY). Cordillera Central, Prov. Monte Cristi, Monción, Arroyo de Majagua, 250 m, *Ekman 13056* (NY). Prov. Santiago Rodríguez, Monción, Meseta, 350 m, *A. P. Liogier 24529* (NY). Prov. La Vega, prope Constanza. 1200 m, *Tuerckheim 3214* (NY).

The plant is locally abundant. It was reported from Jamaica by Walker (1966) as a tetraploid hybrid with n = 152 I; both parents are sexually reproducing tetraploids. The plants, especially the smaller ones, look much like A. pastinacaria, which is not known from the West Indies. Larger specimens look somewhat like A. X paraphyllitidis. The vein anastamoses, though rare, do distinguish it from A. pastinacaria, and the small number of vein unions distinguish it from A. X paraphyllitidis, which has 10 - 15 anastomoses per pinna. The hirsute lamina also helps distinguish it from A. pastinacaria, general is essentially glabrous, at least **abaxia**lly. Its parents involve one (A. hirsuta) with free veins and one (A. underwoodiana) with 6 - 15 (20) anastomoses per pinna. Anemia X paraphyllitidis, on the



Figs. 1A - C. Anemia hybridization. Fig. A. A. underwoodiana. Fig. B. A. X zanoni. Fig. C. A. hirsuta.

other hand, has (20) 25 - 32 unions per pinna, reflecting its parent, A. phvllitidis that has abundant anastomoses (50 - 130 per pinna).

Cyathea sensu lato

Conant (1975), in his summary of hybridization in the West Indian cyatheorid tree ferns, reported three hybrid combinations from Hispaniola.

CNEMIDARIA HORRIDA (L.) Presl X CYATHEA ARBOREA (L.) J.E.Smith (= Hemitelia wilsonii Hook.) DOMINICAN REPUBLIC. Abbott 2660 (GH, NY, US); Prov. Samaná, Sánchez, Ekman 14752 (NY), Laguna 15014 (GH, NY); Prov. Seibo, along coast road from Miches to Higüey, ca. 88 km from Higüey, Gastony, Jones & Norris 654 (GH, NY). HAITI. Massif du Nord, Le Borgne, Morne Chapelet, Ekman 4835 (NY); Poste Marie Congo, 4846 (S, US).

ALSOPHILA HOTTEANA (C.Chr. & Ekman) Tryon X NEPHELEA SP. (= Cyathea confinis C.Chr). HAITI. Massif de la Hotte, Jérémie, Morne L'Etang, Ekman 10382 (S, US).

ALSOPHILA MINOR (D.C. Eaton) R. Tryon X NEPHELEA WOODWARDIOIDES (Kaulf.) Gastony var. HIERONYMII (Brause) Gastony (*Cyathea irregularis* Brause) [parental species determined by Conant in 1975]. DOMINICAN REPUBLIC. Prope Constanza, *Tuerckheim 3212* (NY).

Barrington (1978) suggested that two specimens (*Ekman 14752* and *14824*, both from the DOMINICAN REPUBLIC, Prov. Samaná, Sánchez, labelled *C. pungens* (*Trichopteris procera* (Willd.) R. Tryon) may represent a cross with *Cnemidaria* sp (*Cn. horrida* the only species known on the island).

Diplazium

Apparently hybridization is frequent in the genus, as evidenced by the numerous polyploid counts in the genus. Walker (1966) reported several counts of 4x and 8x. Mickel et al. (1966) and Smith & Mickel (1977) reported two hybrids in the *D. franconis* Liebm. complex and additional polyploid numbers. There are several species complexes and most of the species are only poorly known, so hybrids could easily go undetected.

DIPLAZIUM PLANTAGINOFOLIUM (L.) Urban X D. SP. DOMINICAN REPU-BLIC. Prov. Barahona, Las Filipinas, *Mickel 8990* (NY). *Diplazium plantaginifolium* is common at the site and is distinct by its undivided blade. The hybrid is pinnatifid at the base and the other parent is likely to be pinnate. Several other species of *Diplazium* are present, the only pinnate (to pinnate-pinnatifid) species being *D. cristatum* (Desr.) Alston. The hybrid resembles somewhat *D. vera-pax* Donn.Smith) Hieron. of Central America and *D. riedelianum* Kunze of Brazil, which may also be of hybrid origin.

IS

19

es

1X

Lycopodium

LYCOPODIUM LUCIDULUM Michx. X L. SERRATUM Thunb. DOMINICAN REPUBLIC. Prov. of Barahona, between Monteada Nueva and Loma Alta, *Howard 12306* (A, NY). This is an especially interesting hybrid combination since *L. serratum* is extremely rare (one known locality in the Selle range of Haiti) and *L. lucidulum*, a native of northern North America, has not yet been reported from Hispaniola. However, the authority on the group, Joseph Beitel, has informed me that there can be no question regarding this hybrid's parentage.

LYCOPODIUM CERNUUM L. X SP. DOMINICAN REPUBLIC. Cordillera Central, Prov. Monte Cristi, Monción, high ridge between Río Cenobí and Río San Juan, 2000 m, *Ekman 12829* (NY). The spores are completely abortive, the branch leaves are ascending rather than spreading, the main branch leaves are tightly appressed and nearly hairless, and the cones are longer than in *L. cernuum*. (also the leaves are slightly wider, 1/2 vs. 1/4 mm). There are no known candidates on Hispaniola for the other parent. It may be a South American species with longer cones, appressed leaves and fewer hairs.

Polypodium

POLYPODIUM LANCEOLATUM L. X. P. THYSSANOLEPIS A. Braun ex K1. (P. X *leucosporum* K1.) (Wagner & Wagner, 1975). This is probably the best known hybrid fern on Hispaniola. It also occurs in Jamaica and Colombia, but although both parents are widespread (Mexico to Bolivia, Jamaica, Hispaniola), the hybrid is not known from other areas of overlap. It has been collected several times in both Haiti and Dominican Republic. (DOMINICAN REPUBLIC. Prov. Azua, Culo de Maco, *Fuertes 1964* (NY); Prov. La Vega, prope Constanza ad Río Hondo, *Tuerckheim 3168* (NY), El Salto de Constanza, *Liogier 21038*. HAITI. Massif de La Selle, Morne Tranchant, *Ekman 1179* (NY), Perodin, *Ekman 3478* (see Christensen, 1936), 5.5 km S of Seguin, *Mickel 9329* (NY), 17.7 km W of Mare Rouge toward Seguin, *Zanoni et al. 18675* (JBSD). The parents are quite distinct: *P. lanceolatum* is undivided, *P. thyssanolepis* deeply pinnatifid; the hybrid is irregularly lobed. For details, see Wagner and Wagner, 1975.

In the Polypodium plumula complex, there is at least one species of hybrid origin. Polypodium dispersum A. M. Evans, which is found in many parts of Hispaniola, is thought to have originated as a cross between P. atrum A. M. Evans (diploid) and P. plumula Humb. & Bonpl. ex Willd. (tetraploid) (Evans, 1969). The latter is widespread in tropical America, but the former is known only from Mexico and Central America. Apparently hybridization originally took place in Mesoamenica and the fertile hybrid has greatly expanded its range, which now includes Florida, West Indies, Mexico south to Bolivia and southern Brazil. Others of this complex occurring on the island are tetraploid and may be of hybrid origin -P.

ptilodon var. caespitosum (Jenm.) A. M. Evans, P. camptophyllarium Fée var. camptophyllarium, P. absidiatum A. M. Evans, and P. plumula Humb. & Bonpl. ex Willd.. The species of this complex resemble one another so closely that hybrids are not easily detected.

Polystichum

Members of this genus are known to cross frequently in Europe (Meyer, 1959; Sleep & Reichstein, 1967), Japan (Kurata, 1964, 1969; Mitui, 1975), and North America (W. H. Wagner, 1973; D.H. Wagner, 1979). Seventeen species occur in Hispaniola and their taxonomy is difficult.

POLYSTICHUM PLASCHNICKIANUM (Kunze) Moore X P. TRIANGULUM (L.) Fée. DOMINICAN REPUBLIC. Prov. Pedernales, Sierra de Baoruco, 15 km S of El Aguacate on the Jimaní-Pedernales road, *Mickel 8874* (NY). The hibrid is conspicuous by its intermediate morphology between two distinct parents. The blades of *Polystichum plaschnickianum* are undivides or only pinnatifid at the base and have a proliferous bud at the apex; those of *P. triangulum* are once pinnate and not proliferous; and those of the hybrid are pinnate at the base and only lobed to entire in the terminal third of the blade, are proliferous and have abortive spores.

POLYSTICHUM ECHINATUM (J.F. Gmel.) C.Chr. X P. PLASCHINICKIANUM (Kunze) Moore. DOMINICAN REPUBLIC. Prov. La Estrelleta, Sierra de Neiba, 31-34 km NNW of La Descubierta, *Mickel 8729* (NY), *8811* (NY). This hybrid is similar to the previous one but differs in having the rachis nearly glabrous (rather than densely scaley as in *P. triangulum*) and is pinnate for more of its length. It closely resembles *P. underwoodii* Maxon, previously known only from Jamaica. Walker (1966) reported that species to be a sexually reproducing tetraploid (n = 82 II). Our plants have well-formed spores.

POLYSTICHUM PLASCHNICKIANUM (Kunze) Moore X P. TRAPEZOIDES (Sw.) Presl. DOMINICAN REPUBLIC. Prov. La Vega, Salto de Aguas Blancas, 9.5 km S of Constanza, *Mickel 8500* (NY). This hybrid closely resembles the preceding except for its longer pinnae and deeper cutting at the blade apex. The spores are abortive.

Pteris

PTERIS LONGIFOLIA L. X P. VITTATA L. This hybrids was found by W. H. and F. S. Wagner on the grounds of the Jardín Botánico Nacional in Santo Domingo (W.H. Wagner, pers. comm.). *Pteris longifolia* is the most common species of the genus on the island. *Pteris vittata* is a common weed, found mostly around cities. The two species are closely related and the hybrid is difficult to detect.

Thelypteris

In this large genus of approximately one thousand species, there are approximately 60 species on Hispaniola. Numerous *Thelypteris* hybrids are known from other regions (Smith, 1971; Walker, 1966; Mickel et al., 1966). Two *Thelypteris* hybrids are known from Hispaniola.

THELYPTERIS GRANDIS A. R. Smith X T. SERRA (Sw.) R.St. John (*T.invisa* (Sw.) Proctor). Known from Cuba, Haiti, and Jamaica, it has abortive spores or normal spores. Localities cited by Smith are: HAITI: Nord-Ouest, Massif du Nord, Port-de-Paix, *Ekman 3580* (US); Ouest, vicinity of Mission, *Leonard 3665* (NY, UC, US).

THELYPTERIS KUNTHII (Desv.) Morton X T. SERRA (Sw.) R.St. John. This hybrid is known from Jamaica and the Dominican Republic (Prov. Azua, between Valle Nuevo and San José de Ocoa, *Jones & Norris 1127* (NY) and has abortive spores.

The genus is abundant on the island and there are probably several hybrids undetected as yet.

Literature Cited

Barrington, D.S. 1978. A revision of the genus *Trichipteris*. Contr. Gray Herb. 208: 3 - 93. Christensen, C. 1936. The collections of Pteridophyta made in Hispaniola by E. L. Ekman,

1917 and 1924-1930. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 16(2): 1 - 93.

Conant, D. S. 1975. Hybrids in American Cyatheaceae. Rhodora 77: 441 - 455.

- Evans, A. M. 1969. Interspecific relationships in the Polypodium pectinatum-plumula complex. Ann. Missouri Bot. Gard. 55: 193 293.
- Gómez-Pignataro, L. D. 1980. Contribuciones a la pteridología centroamericana. 4. Novitates. Brenesia 18: 155 170.
- Knobloch, I. W. 1976. Pteridophyte hybrids. Publ. Mus. Michigan State Univ. Biol. Ser. 5(4): 273-352.

Kurata, S. 1964. On the Japanese ferns belonging to the *Polystichum polyblepharum* group. Sci. Rep. Yokosuka City Mus. 10: 17 - 41.

_____. 1969. Additional notes on the Japanese ferns belonging to the Polystichum polyblepharum group. Sci. Rep. Yokosuka City Mus. 15: 44 - 48.

- Manton, I. 1950. Problems of cytology and evolution in the pteridophytes. Cambridge University. Press, London.
- Meyer, D. E. 1959. Polystichum X eberlei (P. braunii X lonchitis), ein neuer Farnbastard. Nova Hedwigia 1: 105 - 114.

Mickel, J. T. 1982. The genus Anemia (Schizaeaceae) in Mexico. Brittonia 34: 388 - 413.

- , W. H. Wagner, & K. L. Chen. 1966. Chromosome observations on the ferns of Mexico. Caryologia 19: 95 - 102.
- Mitui, K. 1975. Chromosome numbers of some Japanese pteridophytes. Bull. Nippon Dental Coll. Gen. Educ. 4: 221 - 271.

- Sleep, A. & T. Reichstein. 1967. Der Farnbastard Polystichum X meyeri hybr. nov. = Polystichum braunii (Spenner) Fée X P. lonchitis (L.) Roth und seine Cytologie. Bauhinia 3: 299 - 309, 363 - 374.
- Smith, A. R. 1971. Systematics of the neotropical species of *Thelypteris* section *Cyclosorus*. Univ. California Publ. Bot. 59: 1 - 136, 5 plates.

_____ & J. T. Mickel. 1977. Chromosome counts for Mexican ferns. Brittonia 29: 391 - 398.

- Wagner, D. H. 1979. Systematics of *Polystichum* in western North America north of Mexico. Pteridologia 1: 1 - 64.
- Wagner, W. H. Jr. 1973. Reticulation of holly ferns (*Polystichum*) in the western United States and adjacent Canada. Amer. Fern J. 63: 99 116.
- _____ & F.S. Wagner. 1975. A hybrid polypody from the New World tropics. Fern Gaz. 11: 125 135.

. 1980. Polyploidy in pteridophytes. pp. 199 - 214. *In:* W. H. Lewis (ed.), Polyploidy: biological relevance. Plenum Publ. Corp., New York.

- Walker, T. G. 1966. A cytotaxonomic survey of the pteridophytes of Jamaica. Proc. Roy. Soc. Edinburgh 66(9): 169 - 237, 5 plates.
- _____ 1973. Evidence from cytology in the classification of ferns. *In:* Jermy, A.C., J.A. Crabbe, & B.A. Thomas, The phylogeny and classification of the ferns. J. Linn. Soc., Bot. 67 (Suppl. 1): 91 110.